Ton Duc Thang University
Center for Applied Information Technology

Course Lecture

FUNDAMENTALS OF INFORMATICS 2

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Course Materials

- Textbooks:
  - Joan Lambert, MOS 2016 Study Guide for Microsoft Excel, 2017.
- References:
  - Joan Lambert, MOS 2016 Study Guide for Microsoft PowerPoint, 2017.
  - John Wiley, Microsoft Official Academic Course, Microsoft Word core 2016, 2016.

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Chapter 5

Applying Formulas and Functions

Chapter 5. Applying Formulas and Functions

5.1 Create Formulas - Operators

5.2 Reference Types

5.3 Apply Named Ranges

5.4 Basic Functions

Chapter 5. Applying Formulas and Functions

- 5.1 Create Formulas - Operators
- 5.2 Reference Types
- 5.3 Apply Named Ranges
- 5.4 Basic Functions

5.1 Create Formulas- Operators

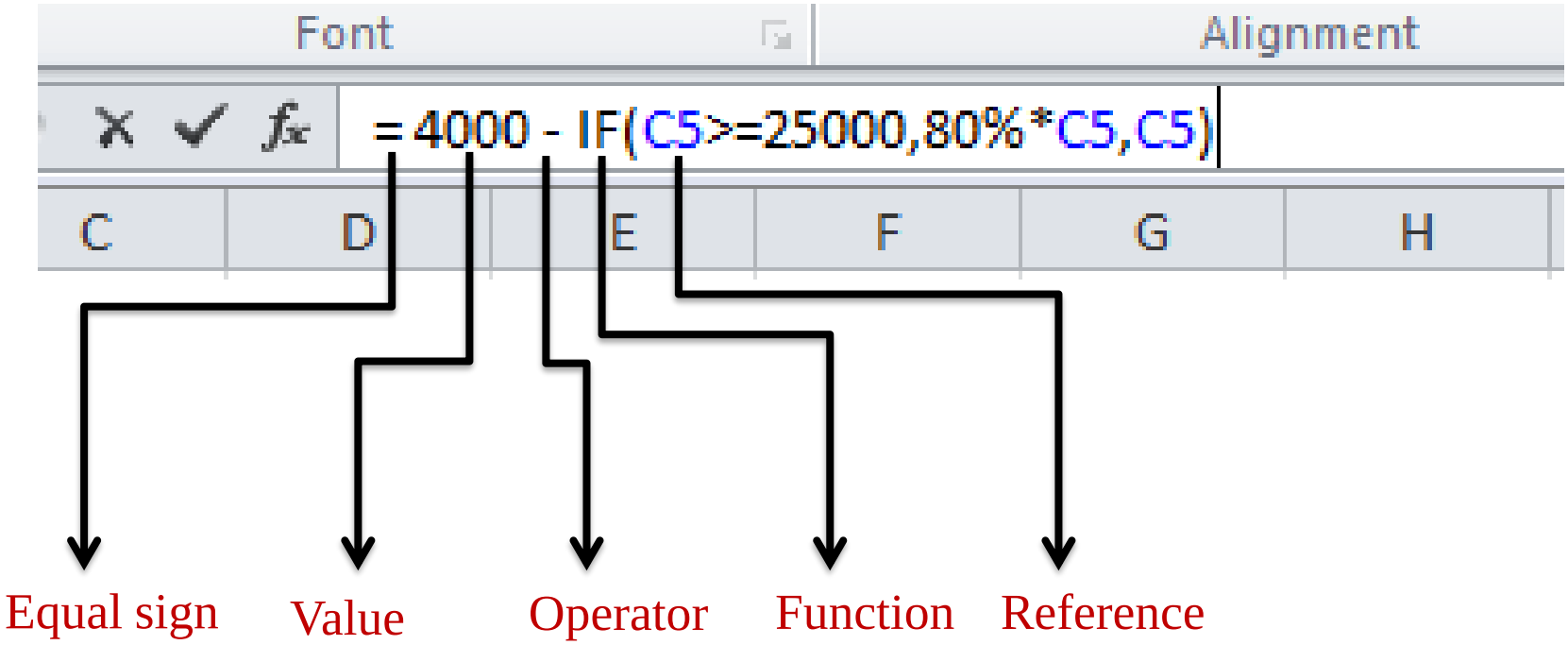
1. Create Formulas
2. Operators in Formulas
3. Enforce Precedence

5.1 Create Formulas - Operators

1. Create Formulas
2. Operators in Formulas
3. Enforce Precedence

1- Create Formulas - Operators

- **Formulas in Excel:** Enter a formula in a cell starting with the equal sign (=)

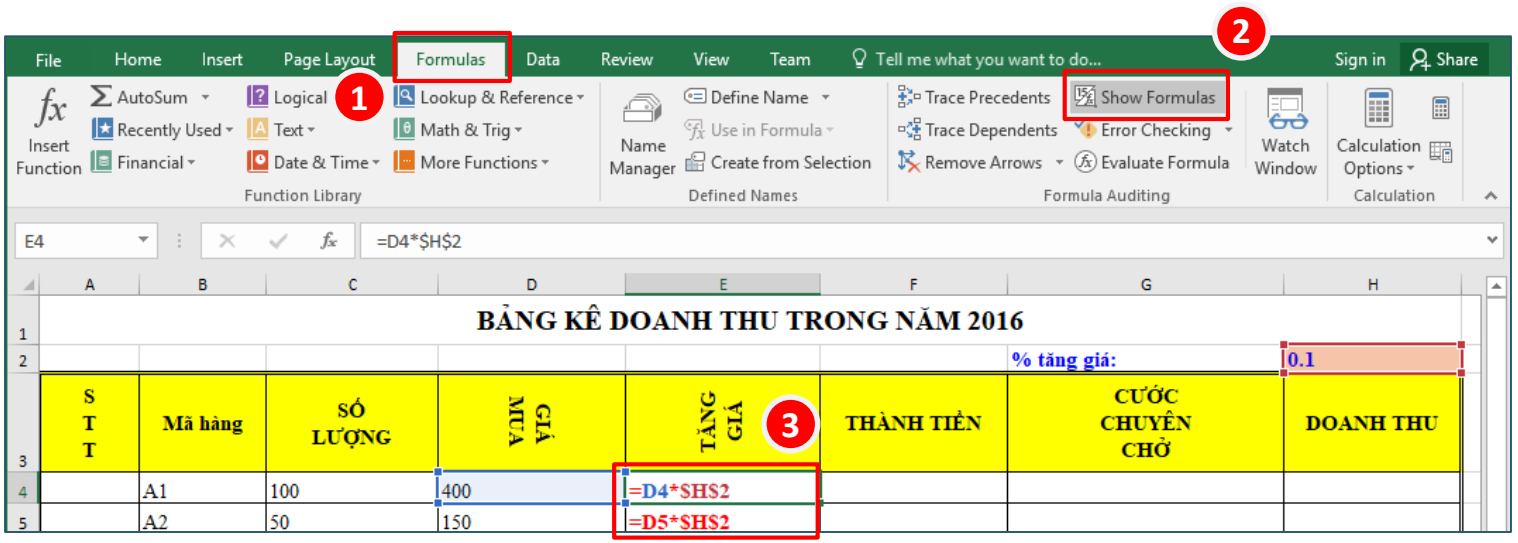


1- Create Formulas - Operators

- **Values:** can be numeric values, string values or logical values
  - Example: 5, “CAIT”, TRUE
- **Operators:** are mathematical operators, comparison operators, concatenation operators and reference operators.
  - Example: +, <, &, :
- **A function:** is a service provided by Excel to do a specific task.
  - Example: SUM(…), COUNT(…), …
- **Reference:** is used to get the contents of worksheet cells
  - Example: A1, C5…

1- Create Formulas - Operators

- Normally, values of formulas are displayed in cells.
- **To show formulas instead of their values in cells:** Tab **Formulas → Show Formulas**



5.1 Create Formulas - Operators

1. Create Formulas
2. Operators in Formulas
3. Enforce Precedence

2- Operators in Formulas

- Reference operators: produce a reference
  - Range operator (:) - one reference to all the cells between two cells references. **Example**: A11:A13
  - Union operator (,) - combines multiple Ranges into one reference.

    Example: A11:A13, A11:C13
  - Intersection operator ( ) (the space) returns a reference to the cell or to the range of cells found at the intersection of the ranges.

    Example: A11:A13 A11:C11 (only cell A11 is found in both ranges)

2- Operators in Formulas

- **Mathematical operators:** give the numeric values
  - Negation: -
  - Percentage: %
  - Exponentiation: ^
  - Multiplication and division: *, /
  - Addition and subtraction: +, -
- **Concatenation operators** – the and symbol (&) : connects two strings of text.
  - **Example**: “CAIT” & “_TDT” -> “CAIT_TDT”

2- Operators in Formulas

- **Comparison operators:** Give the logical values (TRUE or FALSE):
  - Single operators: equal (=), less than (<), greater than (>)
  - Combination operators: greater than or equal (>=), less than or equal (<=), different (<>)
  - **Example**: 5<>3 → TRUE
  - *Notice: You can not combine 2 comparison operators in the form like this: 5<3<1. It is not valid in Excel.*

5.1 Create Formulas - Operators

1. Create Formulas
2. Operators in Formulas
3. Enforce Precedence

3- Enforce Precedence

- Excel processes calculations in this order:

Order	Operator	Symbol
1	Reference operators	(:), (,), ( )
2	Negation	(-)
3	Percentage	(%)
4	Exponentiation	(^)
5	Multiplication and division	(*), (/)
6	Addition and subtraction	(+), (-)
7	Concatenation	(&)
8	Comparison	>, <, =, >=, <=, <>

3- Enforce Precedence

- If multiple calculations within a formula have the same precedence, Excel processes them in order from left to right.
- **To change the order of calculation within a formula**
  - Use the pair of parentheses - () to enclose the calculations you want to perform first.
  - Arrange calculations that have the same precedence in the order you want to perform them, from left to right.

Chapter 5. Applying Formulas and Functions

5.1 Create Formulas - Operators

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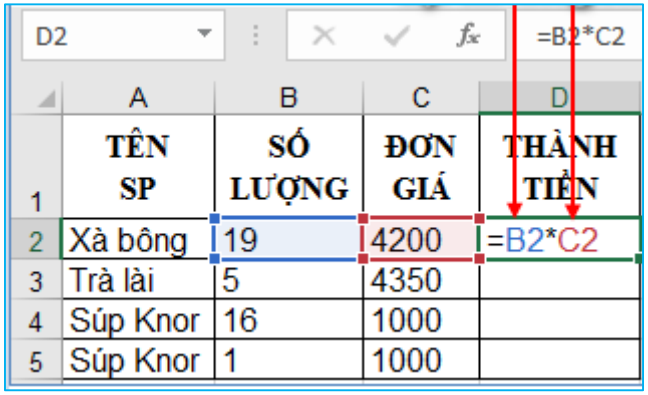
5.2 Reference Types

- Cell References:

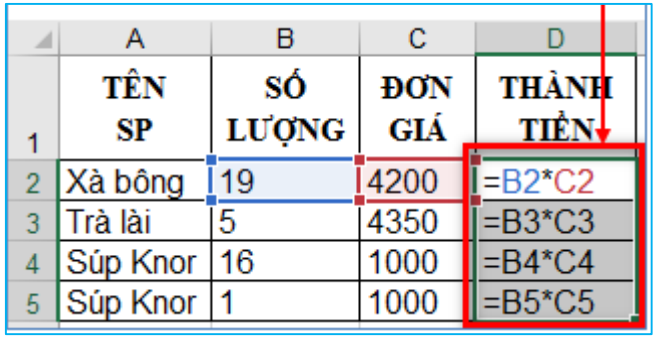
+ A relative reference: takes the form A1. When you copy or fill a formula from the original cell to other cells, a relative reference changes.

+ **Example:**

A relative reference



It will change after filling



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5.2 Reference Types

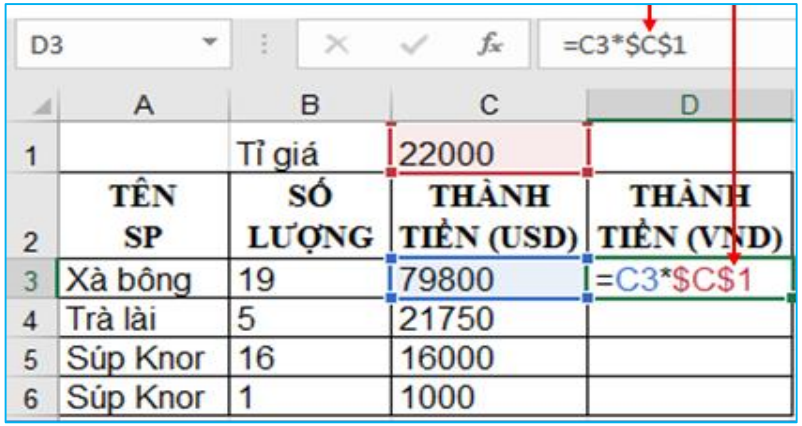
- Cell References (cont):

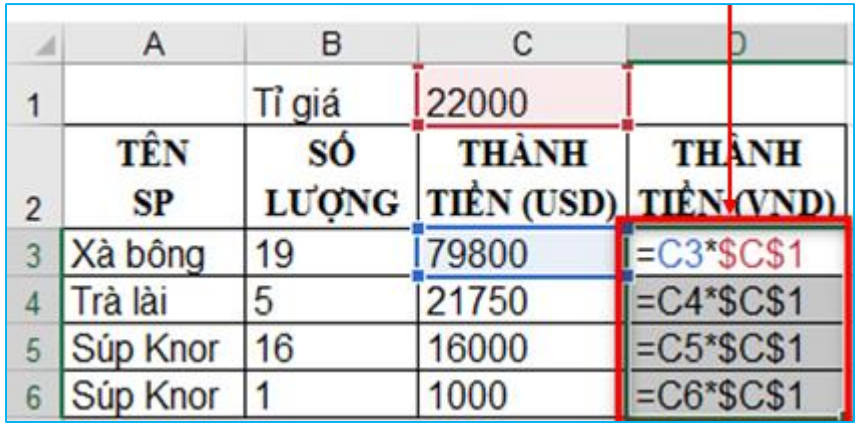
+ An absolute reference: takes the form A1. When you copy or fill a formula from the original cell to other cells, an absolute reference will not change.

+ **Example:**

An absolute reference

It will not change after filling





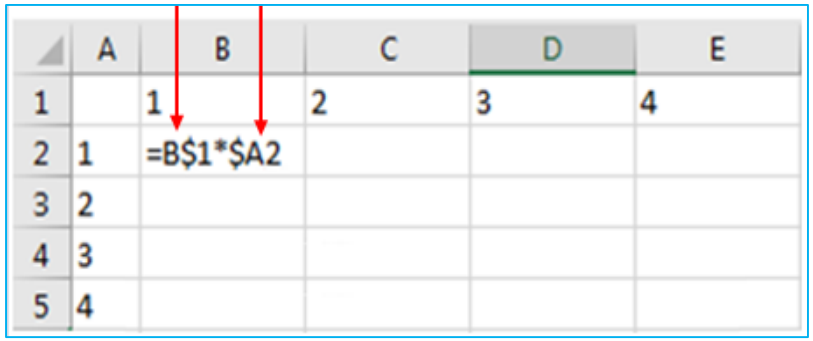
5.2 Reference Types

- Cell References (cont):

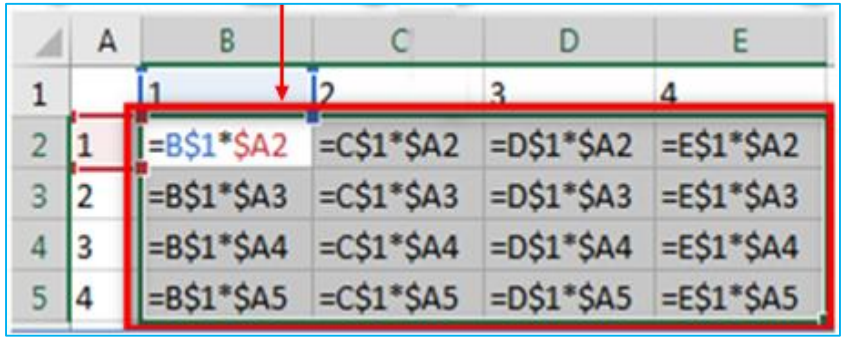
+ A mixed reference: takes the forms $A1 or A$1. The mixed reference *A$1* always refers to row 1, and *$A1* always refers to column A.

+ **Example:**

Mixed references



After filling/copying



+ To change a relative reference to an absolute reference or a mixed reference: Press the **F4** button 1, 2 or 3 times respectively

5.2 Reference Types

- Cell References (cont):

+ A reference a cell on a different worksheet in the same workbook: Take the form **Data!A1** in which **Data** is a worksheet name

+ A reference a cell in another workbook in the same folder: Take the form **[Sales.xlsx]Data!A1** in which **Sales.xlsx** is a workbook name and **Data** is a worksheet name.

Notice: If the worksheet name has spaces, put it in the pair of single quotation marks (‘’)

Chapter 5. Applying Formulas and Functions

5.1 Create Formulas - Operators

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5.3 Apply Named Ranges

- Named Ranges:

+ You can define a name refer to a cell or range of cells and use the defined name in formulas to make them easier to create and read.

+ If you format a cell range as a table, it will be named and all columns of it will be named automatically.

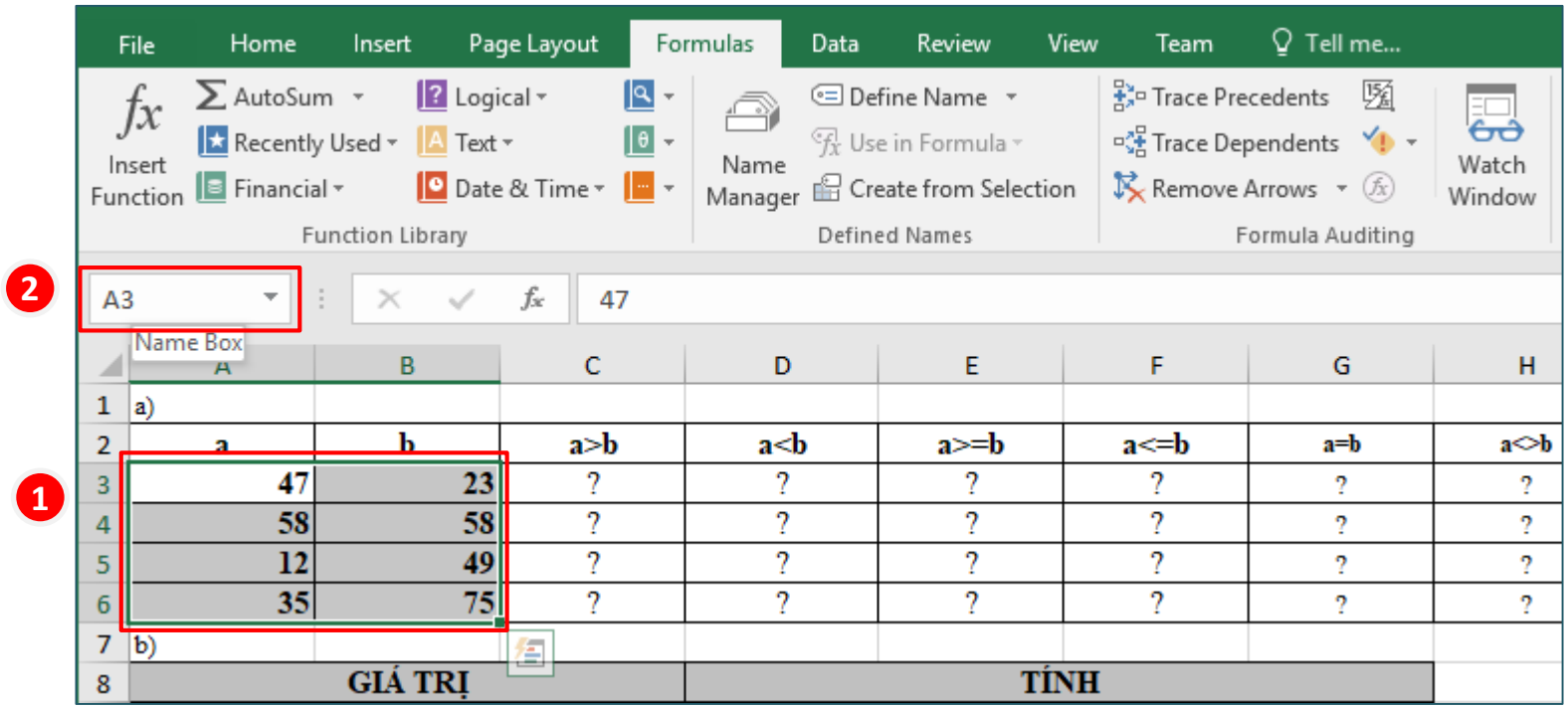
+ A named range in formulas is an absolute reference.

5.3 Apply Named Ranges

- Named Ranges:

+ To define a selected cell or range of cells as a named range:

- **Method 1**: Select cell (or range of cells) → Type the name in the **Name Box** → press **Enter**.

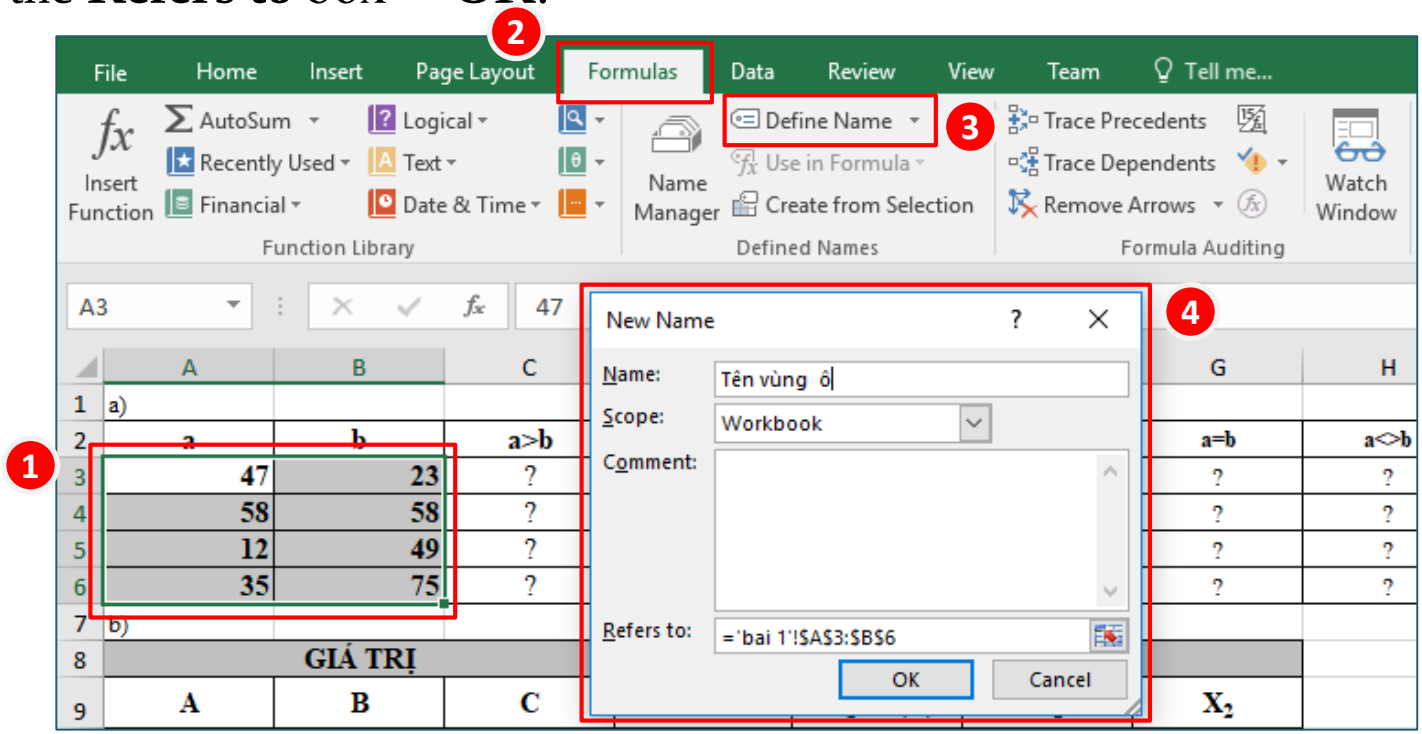


5.3 Apply Named Ranges

- Named Ranges (cont):

+ To define a selected cell or range of cells as a named range:

- **Method 2**: Select cell (or range of cells) → Tab **Formulas** → **Define Name** → enter text in the **Name** box → select **Scope** → edit range in the **Refers to** box→ **OK**.



5.3 Apply Named Ranges

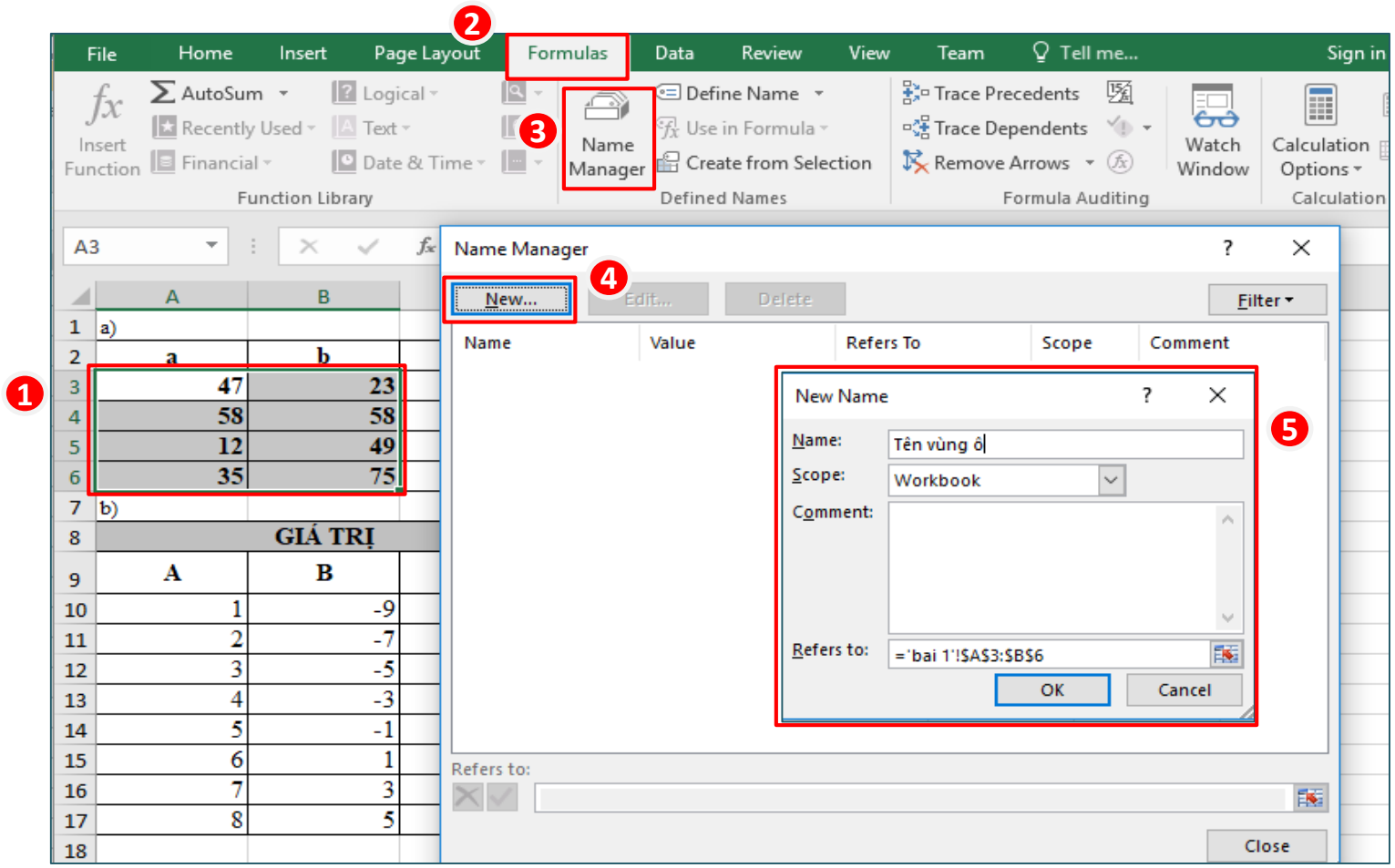
- Named Ranges (cont):

+ To define a selected cell or range of cells as a named range:

- **Method 3**: Select cell (or range of cells) → Tab **Formulas** → **Name Manager** → **New** → enter text in the **Name** box → select **Scope** → edit range in the **Refers to** box→ **OK** → **Close**.

5.3 Apply Named Ranges

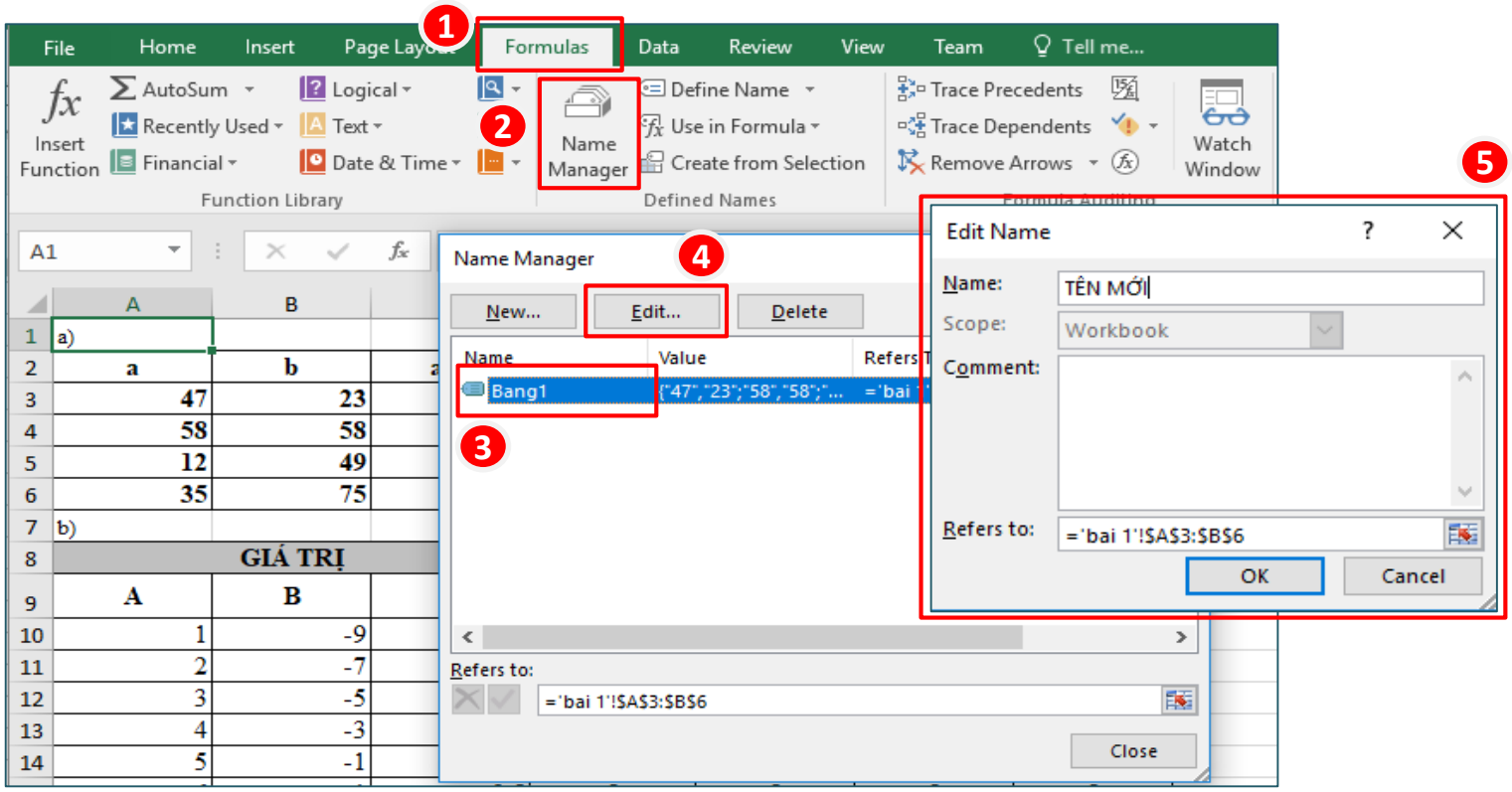
- **Method 3 (tt):**



5.3 Apply Named Ranges

- Named Ranges (cont):

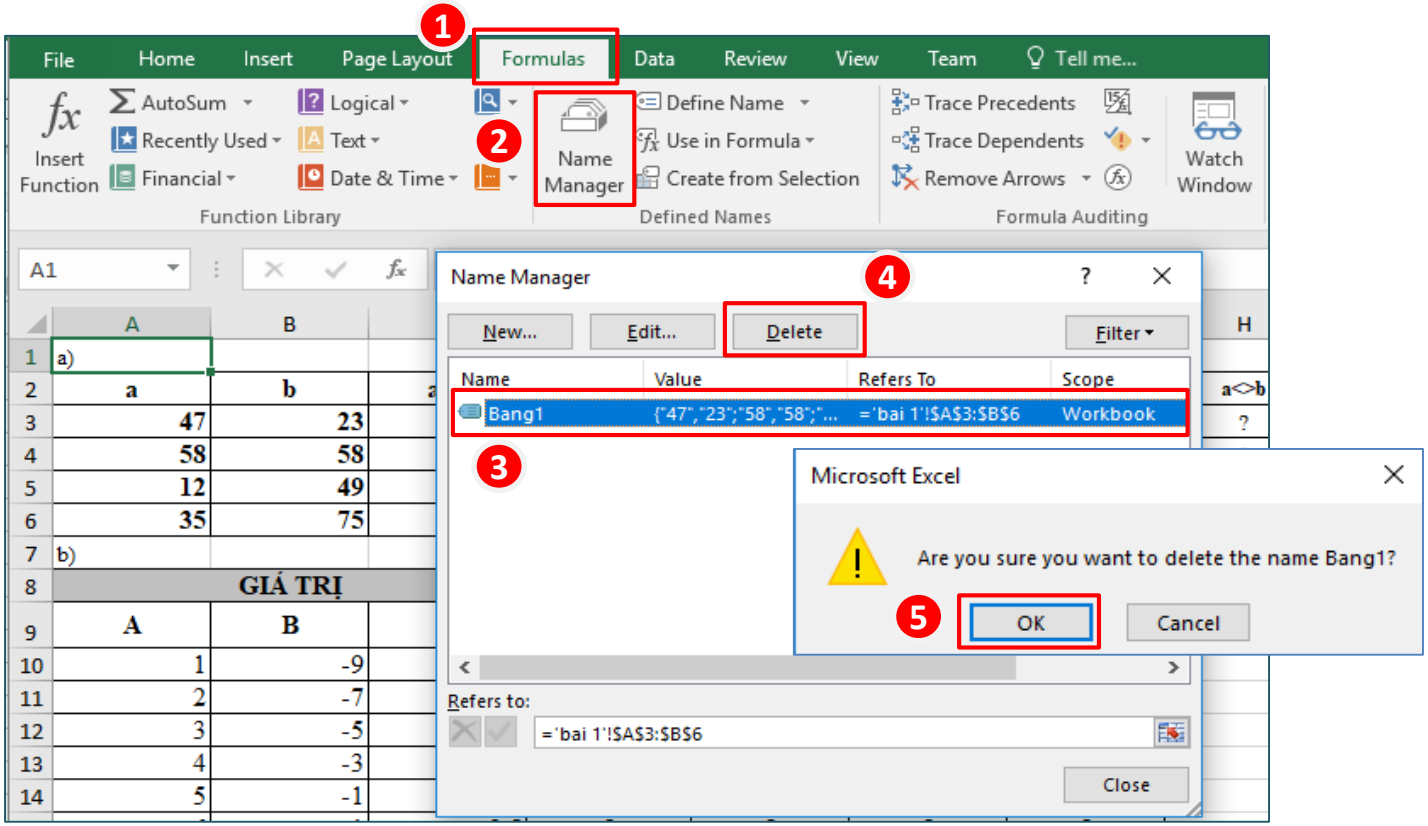
+ To edit a named range: Tab **Formulas** → **Name Manager** → select the name → **Edit** → enter new name in the **Name** box→ edit the range in the **Refers to** box → **OK** → **Close**.



5.3 Apply Named Ranges

- Named Ranges (cont):

+ To delete a name: Tab **Formulas** → **Name Manager** → select the name → **Delete** → **OK** → **Close**.



	A	B
2	a	b
3	47	23
4	58	58
5	12	49
6	35	75
9	A	B
10	1	-9
11	2	-7
12	3	-5
13	4	-3
14	5	-1

Chapter 5. Applying Formulas and Functions

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5.4 Basic Functions

5.4 Basic Functions

1. Function overview
2. Simple statistical functions
3. Text functions
4. Date functions

5.4 Basic Functions

1. Function overview
2. Simple statistical functions
3. Text functions
4. Date functions

1- Function overview

- Introduction:

+ Functions: are predefined formulas and are already available in **Excel** to do specific tasks. Those tasks might be to perform a math operation, to make a decision or to perform an action on some text with the same structure.

+ Structure: **<Function_Name>(Arguments)**

Notice: + Enter the name exactly.

+ There must be a pair of parentheses.

+ There may be no, one or many arguments. If there are more than one arguments, they are separated by colon (:)or semicolon (;).

+ A function may be an argument of another function.

5.4 Basic Functions

1. Function overview
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2- Simple statistical functions

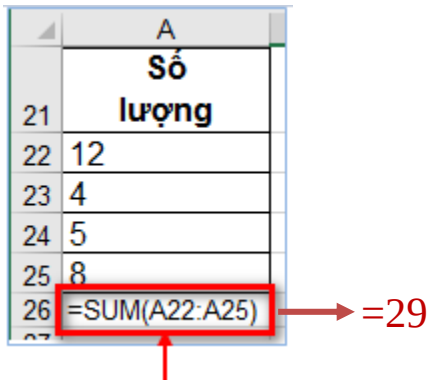
- SUM function:

+ Syntax: **SUM(number1,[number2],...)**

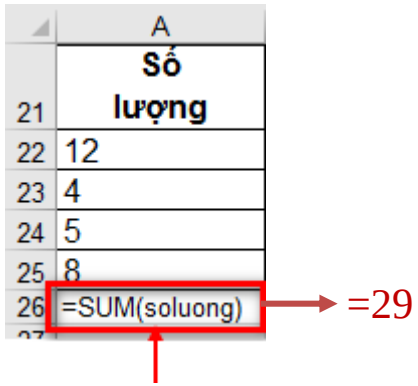
+ Task: Adds values to calculate the total value.

+ Arguments: can be values, cell references, ranges, named ranges or another functions (all arguments are numeric values).

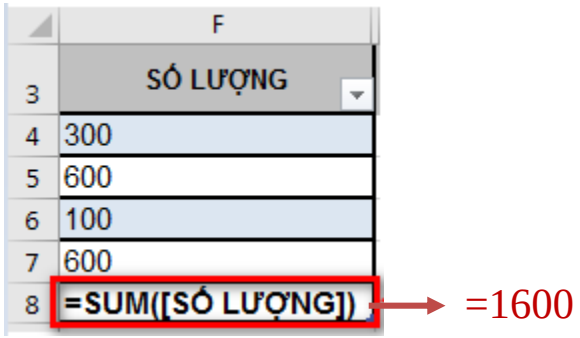
+ **Example**:



Sum of cell range



Sum of named range



Sum of a table column

2- Simple statistical functions

- MAX function:

+ Syntax: **MAX(number1, [number2], ...)**

+ Task: Returns the largest value in a set of values.

+ Arguments: can be values, cell references, ranges, named ranges or another functions (all arguments are numeric values)

+ **Example**:

- MAX(3,14,5): → ***The result is*** 14.
- Formula: =MAX(A1:C1): → ***The result is*** 190.

	A	B	C
1	50	190	50

2- Simple statistical functions

- MIN function:

+ Syntax: **MIN(number1, [number2], ...)**

+ Task: Returns the smallest value in a set of values.

+ Arguments: can be values, cell references, ranges, named ranges or another functions (all arguments are numeric values)

+ **Example**:

- MIN(3,14,5): → ***The result is*** 3.
- Formula: =MIN(A1:C1): → ***The result is*** 50.

	A	B	C
1	50	190	50

2- Simple statistical functions

- AVERAGE function:

+ Syntax: **AVERAGE(number1,[number2],...)**

+ Task: Returns the average (arithmetic mean) of the arguments.

+ Arguments: can be values, cell references, ranges, named ranges or another functions (all arguments are numeric values)

+ **Example**:

- AVERAGE(3,14,4): → ***The result is*** 7.
- Formula: =AVERAGE(A1:C1): → ***The result is*** 96.67.

	A	B	C
1	50	190	50

2- Simple statistical functions

- COUNT function:

+ Syntax: **COUNT(value1, [value2], ...)**

+ Task: Returns the number of cells that contain numeric values.

+ Arguments: can be values, cell references, ranges, named ranges or another functions.

+ **Example**:

- COUNT(3,14,4): → ***The result is*** 3.
- Formula: =COUNT(A1:C1): → ***The result is*** 2.

	A	B	C
1	50	M	50

2- Simple statistical functions

- COUNTA functions:

+ Syntax: **COUNTA(value1, [value2], ...)**

+ Task: Counts the number of cells that are not empty in a range

+ Arguments: can be values, cell references, ranges, named ranges or another functions.

+ **Example**:

- COUNTA(3,14,"4"): → ***The result is*** 3.
- Formula: =COUNTA(A1:C1): → ***The result is*** 2.

	A	B	C
1	50		a

2- Simple statistical functions

- COUNTBLANK function:

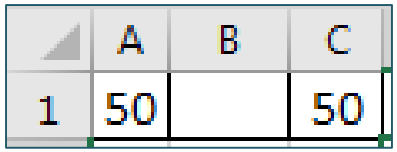
+ Syntax: **COUNTBLANK(range)**

+ Task: Counts the number of empty cells in a range

+ Arguments: range of cells.

+ **Example**:

  - Formula: =COUNTBLANK(A1:C1): → ***The result is*** 1.



	A	B	C
1	50		50

5.4 Basic Functions

1. Function overview
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3- Text functions

- LEFT function:

+ Syntax: **LEFT(text, [num_chars])**

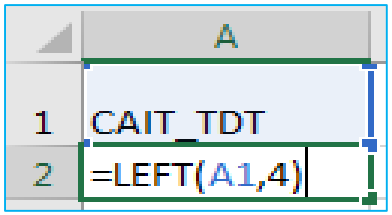
+ Task: To extract the leftmost characters from a string.

+ Arguments:

- *text*: The text string that contains the characters you want to extract.
- *num_chars*: the number of characters you want to extract.

Example:

- LEFT("Microsoft",5) → ***The result is*** **Micro**



→ ***The result is*** **CAIT**

3- Text functions

- RIGHT function:

+ Syntax: **RIGHT(text, [num_chars])**

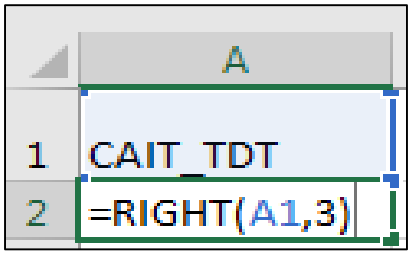
+ Task: To extract the rightmost characters from a string.

+ Arguments:

- *text*: The text string that contains the characters you want to extract.
- *num_chars*: the number of characters you want to extract.

Example:

- RIGHT("Microsoft",4) → ***The result is*** **soft**



→ ***The result is*** **TDT**

3- Text functions

- MID function:

+ Syntax: **MID(text, start_num, num_chars)**

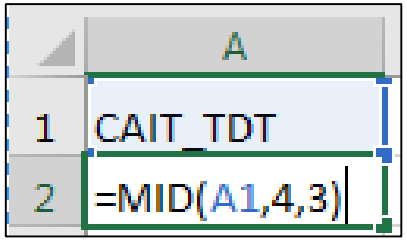
+ Task: To extract a substring, starting in the middle of a string.

+ Arguments:

- *text*: The text string that contains the characters you want to extract.
- *start_num:* The position from the left of the first character to extract
- *num_chars*: the number of characters you want to extract.

Example:

- RIGHT("Microsoft",5,2) → ***The result is*** **os**



→ ***The result is*** **T_T**

3- Text functions

- UPPER function:

+ Syntax: **UPPER(text)**

+ Task: Converts text to uppercase.

+ Arguments:

- *text*: The text you want converted to uppercase. Text can be a reference or text string.

Example:

- UPPER("Microsoft") → ***The result is*** **MICROSOFT**

	A
1	cait
2	=UPPER(A1)

→ ***The result is*** **CAIT**

3- Text functions

- LOWER function:

+ Syntax: **LOWER(text)**

+ Task: Converts all uppercase letters in a text string to lowercase.

+ Arguments:

- *text*: The text you want to convert to lowercase. Text can be a reference or text string.

Example:

- LOWER("Microsoft") → ***The result is*** **microsoft**

	A
1	CAIT
2	=LOWER(A1)

→ ***The result is*** **cait**

3- Text functions

- PROPER function:

+ Syntax: **PROPER(text)**

+ Task: Capitalizes the first letter of each word in a text string, converts all other letters to lowercase letters.

+ Arguments:

- *text*: The text you want to convert to partially capitalize. Text can be a reference or text string.

Example:

- PROPER("microsoft office") → ***The result is*** **Microsoft Office**

	A
1	CAIT
2	=LOWER(A1)

→ ***The result is*** **Cait**

3- Text functions

- LEN function:

+ Syntax: **LEN(text)**

+ Task: returns the number of characters in a text string.

+ Arguments:

- *text*: The text whose length you want to find. Spaces count as characters. Text can be a reference or text string.

Example:

- LEN("Microsoft Office") → ***The result is*** **16**

	A
1	CAIT_TDT
2	=LEN(A1)

→ ***The result is*** **8**

3- Text functions

- VALUE function:

+ Syntax: **VALUE(text)**

+ Task: Converts a text string that represents a number to a number..

+ Arguments:

- *text*: The text you want to convert. Text can be a reference or text string.

Example:

- VALUE("561") → ***The result is*** **561**

	A
1	091
2	=VALUE(A1)

→ ***The result is*** **91**

5.4 Basic Functions

1. Function overview
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4- Date functions

- NOW function:

+ Syntax: **NOW ()**

+ Task: Returns the serial number of the current date and time.

+ Arguments: The NOW function syntax has no arguments

Example:

- NOW() → ***The result is*** **the current date and time**

4- Date functions

- TODAY function:

+ Syntax: **TODAY ()**

+ Task: Returns the serial number of the current date.

+ Arguments: The TODAY function syntax has no arguments

Example:

- TODAY() → ***The result is*** **the current date**

4- Date functions

- DATE function:

+ Syntax: **DATE(year, month, day)**

+ Task: combines three separate values to form a date.

+ Arguments:

- *year*: A number represents the year value.
- *month:* A number represents the month value.
- *day*: A number represents the day value.

Example:

- DATE(2016,3,23) → ***The result is*** 3/23/2016 (based on default Regional Settings in Control Panel with the date format **mm/d/yyyy**)

4- Date functions

- DAY function:

+ Syntax: **DAY(serial_number)**

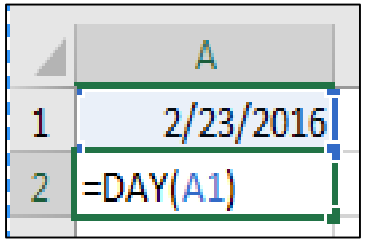
+ Task: Returns the day of a date, represented by a serial number.

+ Arguments:

- *serial_number*: The date of the day you are trying to find. It can be a reference or a result of other formula or function

Example:

- DAY(DATE(2018,10,25)) → ***The result is*** **25**



→ ***The result is 23***

4- Date functions

- MONTH function:

+ Syntax: **MONTH (serial_number)**

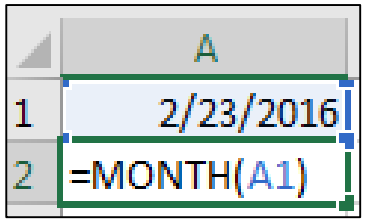
+ Task: Returns the month of a date, represented by a serial number.

+ Arguments:

- *serial_number*: The date of the month you are trying to find. It can be a reference or a result of other formula or function

Example:

- MONTH(DATE(2018,10,25)) → ***The result is*** **10**



→ ***The result is*** **2**

4- Date functions

- YEAR function:

+ Syntax: **YEAR (serial_number)**

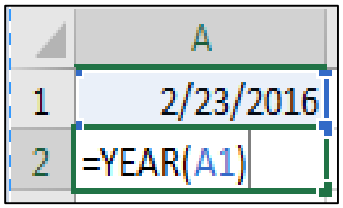
+ Task: Returns the year of a date, represented by a serial number.

+ Arguments:

- *serial_number*: The date of the year you are trying to find. It can be a reference or a result of other formula or function

Example:

- YEAR(DATE(2018,10,25)) → ***The result is*** **2018**



→ ***The result is*** **2**

Chapter 5. Applying Formulas and Functions

5.1 Create Formulas - Operators

5.2 Reference Types

5.3 Apply Named Ranges

5.4 Basic Functions